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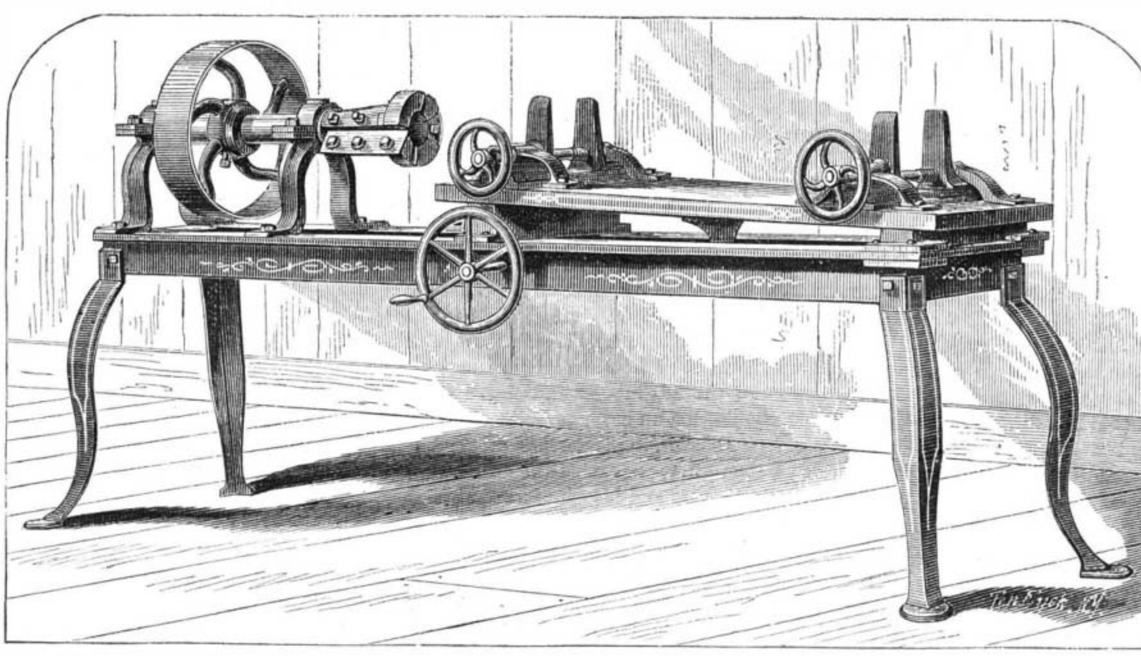
Machine for Turning the Ends of Axletrees.

Our engraving gives a very good representation of a machine for turning the ends of axletrees. It is said it will turn the ends to fit thimble skeins in a most accurate manner. The general principle of the machine convinces us that it must work satisfactorily, in which opinion, we doubt not, practical wagon manufacturers will concur.

The bed of the machine rests on suitable legs. On this bed are placed a head stock and spindle, carrying a cutter head and pulley for driving the same. The bed also supports a carriage for the axle, the ends of which are to be turned. The carriage runs on suitable ways, by which it is fed up in line with the cutter head, the feeding being performed by a rack and pinion movement, placed in the central space of the bed piece, and actuated by a short counter-shaft and a hand wheel placed at about the middle of the machine, as shown.



MACHINE FOR TURNING THE ENDS OF AXLETREES.

At each end of the carriage are clamping jaws drawn together by hand screws, as shown. The axle being held firmly in these jaws is fed up to the cutter head by turning the side hand wheel, as above described.

The cutter is made on the same principle as the tool ordinarily used by wagon makers for turning spokes.

This tool is said to cut knotty or crossgrained wood smoothly. The method of adjusting the clamping jaws permits adjustment to secure the proper gather and pitch in the wheels, while the axle is cut to the exact length required. Of course the machine, being once set, will cut all the axles alike, so that the same gather and pitch will be obtained on all.

The machine is stoutly built entirely of iron, and weighs 1,000 pounds. The manufacturers claim that it will turn out 200 axles in 10 hours.

Patented June 8, 1869. Address, for further particulars, A. Booth, Son & Co., manufacturers of carriages, buggies, and wagons, Springfield, Ill.

SCHOPP'S PUSH CHAIR OR ICE VELOCIPEDE.

Our engraving shows a push chair, styled by its inventor and patentee, Philip J. Schopp, of Louisville, Ky., an "ice velocipede." It is a cross between a camp chair and an ice boat, and is constructed so that it may be folded into very small space, as shown at the bottom of the engraving.

Fig.1

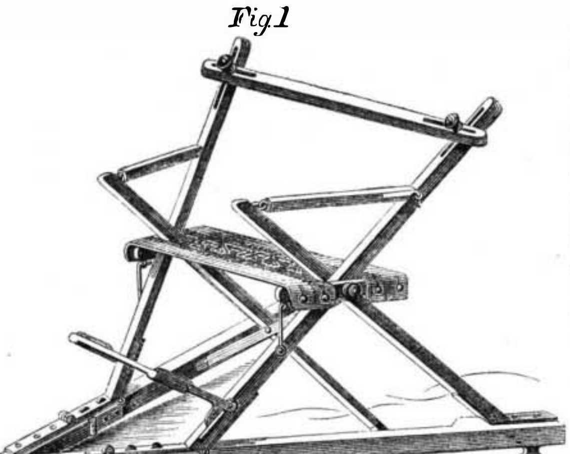
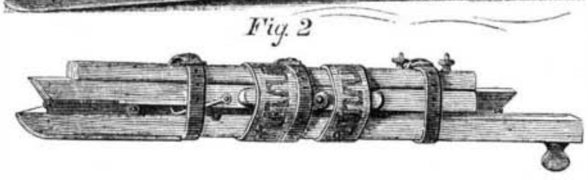


Fig. 2



The seat is flexible, and may be made wide enough to accommodate two or more persons. A convenient support for the feet is also provided, as shown in the principal figure in the engraving, representing the velocipede in readiness for use.

The bottom frame is triangular, like that of the ordinary ice boat, the apex of the triangle resting upon a skate runner, while the rear corners run either on skate runners or rollers (the former being preferred), making it very easy both to propel and guide. Loaded to its full capacity it may be pushed at rapid speed by a single skater, who only employs one hand to push and guide it. A boy ten years old may, it is stated, push it easily when an adult occupies the seat.

The back rail offers a capital support for ladies while learning to skate.

By the use of a double hinge the runners may be made so that they can be set parallel for use on the streets.

On the whole, we judge this invention will be received with favor by all fond of ice sports. The entire apparatus, when folded, strapped together, and placed in a suitable canvas bag, weighs only about five pounds.

It is covered by two patents dated as follows: February 9, 1869, and October 18, 1870.

For further particulars, address Philip Schopp, 445 Jefferson street, Louisville, Ky.

International Exhibition in London.

The exhibition is now in full operation, and attracts much attention; but it is not a mechanical exhibition. Textile and pottery subjects are among the principal industries that are represented. Says *Engineering:*

Conspicuous amongst the machinery in motion connected with the pottery department, is Pinfold's brick, tile, and drain pipe machine. This latter, to which the first prize of its class was awarded at the Oxford meeting of the Royal Agricultural Society, cuts the clay as it is carried forward on an endless band, in a continuous stream from the pug mill, by means of a series of radial wires stretched upon a large wheel, which travels at the velocity required to cut the bricks to size, and which is set at an angle, to counteract the forward motion of the clay, and to insure a square cut. The several potters' wheels exhibited attract great attention, owing, however, to the fact that operators are constantly at work on the wheels, molding rapidly with skilful fingers, and with enviable facility, vessels of all descriptions. The manufacture of tobacco pipes is shown, Mr. W. T. Blake and Messrs. Southern & Co. being the exhibitors, and the operators show as much dexterity in producing these articles of universal use, as do the potters near them.

Thirty gross of short pipes is the average production of each man's work during six working days of ten hours each, being at the rate of seventy-two per hour. Of course this does not include the production of the clay blanks, nor the subsequent trimming of the edges which is required, but it comprises the various operations of piercing the blank stems, covering them with a coating of paraffin, placing them in the mold and lever press by which the bowls are shaped and hollowed out, and cutting out the dead head of clay which is squeezed out by the press.

Minton & Co.'s stamping press for producing mosaic bricks is worth noticing. Slabs from 1½ inches square, used for flooring tiles, down to the minute pieces employed for delicate mosaics, are made here. The machine is a vertical screw press, in which are fitted dies corresponding to the size and shape of the small tiles required; for the smaller sizes four or five dies are grouped together. These dies, when they are depressed, pass through openings in a circular metal table into matrices below. The clay, finely pulverized and colored by different pigments, as desired, is heaped upon the table, and a small portion is swept into the matrices by hand at each downward stroke of the press. With the backward stroke, by a motion of the foot of the operator, the matrices are raised, and the slabs of compressed clay are thrown out and placed on one side to be submitted to the final processes.

A Foreign Tribute to American Mechanics.

A few weeks ago the London *Times*—universally considered the ablest and most influential paper in all Europe—published the following significant comment on the wane of British manufactures:

"At this moment, Birmingham is losing its old market. A few years ago it used to supply the United States largely with edged tools, farm implements, and various smaller wares. It does so no longer, nor is the cause to be sought merely in the American tariff. It is found that the manufacturers of America actually supersede us, not only in their own, but in foreign markets and in our own colonies, and the Birmingham Chamber has the sagacity to discover, and the courage to declare, that this is owing to the superiority of American goods.

"High as are the wages of an English artisan, those of an American artisan are higher still, and yet the manufacturers of the United States can import iron and steel from this country at a heavy duty, work up the metal by highly paid labor, and beat us out of the market after all with the manufactured articles. How is that to be explained?

"The Americans succeed in supplanting us by novelty of construction and excellence of make. They do not attempt to undersell us in the mere matter of price. Our goods may still be the cheapest, but they are no longer the best, and in the country where an ax for instance, is an indispensable implement, the best article is the cheapest, whatever it may cost. Settlers and emigrants soon find this out and they have found it out to the prejudice of Birmingham trade."

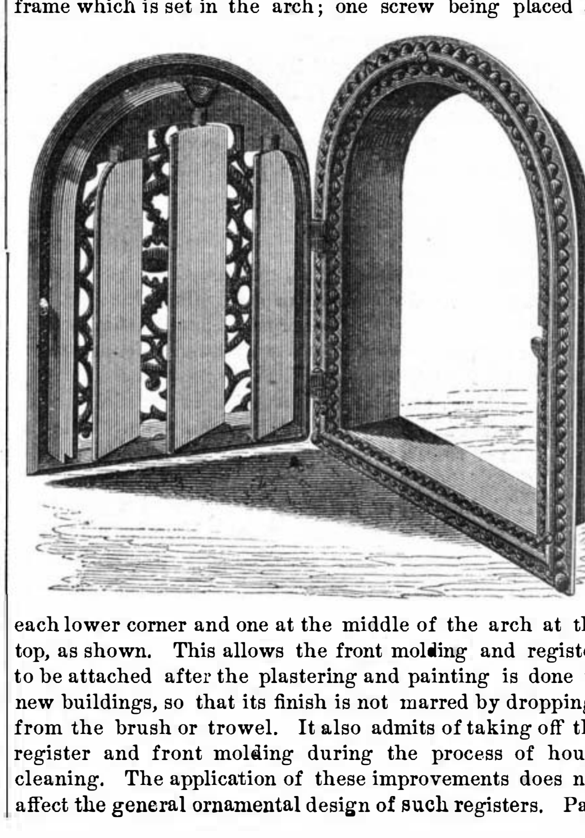
YOUNG'S IMPROVED HOT AIR REGISTER.

This invention is an illustration of the fact that a very slight change in form will sometimes add greatly to the utility and convenience of articles in common use.

The engraving shows the nature of the improvement so clearly that no letters of reference will be required.

The first improvement consists in hinging the register to a frame, as shown. This permits the removal of dust, and allows the register to be swung open, so that the feet can be placed in the flue for warming them. Also articles for the nursery and sick room can be set therein and conveniently warmed.

The second improvement consists in attaching the exterior frame molding, by screws, to the retreating part of the frame which is set in the arch; one screw being placed at



each lower corner and one at the middle of the arch at the top, as shown. This allows the front molding and register to be attached after the plastering and painting is done in new buildings, so that its finish is not marred by droppings from the brush or trowel. It also admits of taking off the register and front molding during the process of house cleaning. The application of these improvements does not affect the general ornamental design of such registers. Patented April 25, 1871, by William Young, of Easton, Pa. For further information address either the patentee, as above, or the Tuttle & Bailey Manufacturing Company, 74 Beekman street, New York.

THE APPLICATION OF STEAM TO CANALS.--NO. 2.

BY GEORGE EDWARD HARDING, ESQ., C.E.

In 1472, long before canals, attempts had been made to substitute for the manual labor of oars, the propulsion of boats by wheels moved by oxen; while, on the 17th of June, 1543, with a precision of date which throws much doubt on the probability, the Spaniards claim the construction of a steam-moved vessel. Mention of galleys driven by side wheels are found in the years 1578 and 1587; while, in 1618, David Ramsay obtained a patent from the Crown to apply engines "to make boates for the carriage of burthens and passengers runne upon the water as swift in calms, and more saff in storms, than boats full sayled in great windes;" and again, in 1630, was issued to him a second patent, for a similar purpose.

The many schemes for propelling boats which have been carried to a further or less degree of experiment or practical use since Ramsay's day, are too curious not to be classified, and, at the risk of tediousness, the manner and means for obtaining power of various kinds are enumerated:—From wind, by sails, kites, balloons, and windmills, on deck; from oars, worked by men, animals, and steam; from paddle wheels and screw propellers, placed in every possible part of a vessel, and variously constructed and driven; from the vessel's motion, and from the motion of mercury: from the current-operating machinery on board; from springs and from weights, differently operated; from the explosion of gunpowder, and from gases, either generated

the discharge of steam, compressed air, and from falling water. Electricity is to afford the motive power in six instances; while an endless chain, lying upon the bottom of the canal, and passing over various parts of the machinery, has strong advocates. Some haul the craft along by a rope fixed on shore, and some again by a smooth or rack rail on the banks, with which wheels driven from the boats engage. Thirteen sanguine inventors claim that a locomotive moving along the canal, and towing after the manner employed by horse boats, is the only solution of the vexed question, while nearly as many believe that an atmospheric railway is the only system suitable. The larger number of workers in this field have affected the direct discharge of water at the stern as the greatest good; a less number, by the discharge of air in various ways. One by discharging fire under water is peculiar, though hardly so curious as Congreve's device of sponges for propelling a vessel by capillary attraction. Several of the earlier motors were to achieve their end by thrusting poles against the bottom of the canal; two by water in a tube on the shore, suitably connected with the boat. Bourne and others advise either wheels rolling on the bottom, or the adoption of screws so working, which seem to have many disadvantages; but the action of reciprocating rods, armed with fixed floats or valved pistons, shaped as wedges, cones, or as hollow vessels, and worked at the sides, or under the bottom of the boats, either in or out of channels, has always been a favorite plan, opposed again by a numerous class, who allow the reciprocating motion, but insist that movable floats only can succeed. Variations of this last consist in hinged boards and collapsing propellers, operated in divers ways, while some, in their search for novelty, call all the others wrong, and place the floats at once upon an endless chain, by which they hope to use less power and gain more speed. Water or steam, acting in flexible tubes, ends the list. Among all our counsellers, whom shall we select

Some of these devices are deserving of more than such wholesale notice, and we will particularize a few of the more prominent.

Passing over one hundred and fifty years, during which time we have the invention of the steam engine, and the early labors of such men as Papin, Savory, Jonathan Hulls, James Watt, and Symington, we reach the invention of Patrick Miller, who, in 1787, especially claimed an application of machinery for the purpose of inland navigation. His invention comprised either double or triple vessels, having two or three separate hulls, with one deck over all, with paddle wheels, of any required number, placed in the space between the hulls, so as to be submerged to an advantageous depth. Originally designed to be operated by a capstan, worked by a windmill or manual power, the arguments of Symington, who applied the steam engine, changed the original idea of motive power, and successful experiments were made, in the summer of 1788 and the winter of 1789, upon the Forth and Clyde canal, where a speed of nearly seven miles an hour was obtained Notwithstanding this success, it seems that Mr. Miller did not consider the invention as practical, since, in 1796, we find Miller again applying for a patent for the construction of vessels propelled by wheels worked by capstans, as in the original scheme.

In 1788, John Fitch, an American, obtained a patent from the States of Pennsylvania, New York, New Jersey, and Delaware, for the application of steam to navigation, and also opposed the application of James Rumsey, for a similar patent, the same year. Fitch succeeded in driving his steamboat eighty miles in one day, by means of six oars, or paddles, working perpendicularly on each side of the boat, similar to the strokes of the paddles of a canoe; but his invention came to no practical use.

Rumsey, who had been refused a patent in his native country, came to England, and, in November, 1788, obtained letters patent of Great Britain, for propelling boats on rivers and canals, by alternately moving a valved box backward and forward under the keel of a vessel, by means of his steam engine. The box opened toward the stern, was provided with a valve at the forward end, which, opening as the box moved forward, allowed the water to pass freely, but, closing with the opposite movement, propelled the boat ahead. A second part of his specification describes an arrangement for drawing water at the bow into a hollow, longitudinal trunk, parallel with the keel, and discharging the same at the stern, by the reciprocating strokes of a large pump. Rumsey also devised two wheels, projecting from the bow of a canal boat, which carried an endless chain with floats. The current was supposed to actuate this mechanism, which, by operating a series of poles for pushing against the bottom of the channel, propelled the boat. The similitude of the plan with that of a man lifting himself over a fence by the straps of his boots, is obvious. The death of Rumsey, in 1792, prevented any practical application of his inventions, though his associates, in the spring of 1793, obtained a speed of four miles per hour on the Thames, from a boat arranged upon his pump system, as described, which boat Rumsey had nearly completed at the time of his death.

Next in order, in the year 1801, Mr. Symington was employed by Lord Dundas to experiment, with the view of substituting steam for the horse boats on the Forth and Clyde canal. After two years experimenting, and at an expense of over £7,000, the *Charlotte Dundas* was completed, and launched on the canal in March, 1803. In this boat were first combined all the principal features of our modern paddle wheel steamers, namely, the double reciprocating engine, with connecting rod, and the crank on the axis of the rotary paddle wheel. The paddle wheel—for there was but one—was placed near the stern, in the center of the boat. This seems to have proved a perfect success in regard to self propulsion and towing of other boats; but, though the efficacy of the system was proved, the opinion of the canal proprietors, that the waves it created would damage the banks, prevented its adoption. Notwithstanding the decision of the Forth and Clyde managers, the Duke of Bridgewater, after a careful investigation of the advantages and the supposed drawbacks, gave Mr. Symington an order to build eight boats similar to the *Charlotte Dundas*, to ply on his canal; but the death of the Duke, soon after, prevented the execution of the scheme, and poor Symington and his canal navigation were neglected together.

The ingenious experiments of Stevens, Evans, and Fulton, in America, about this time, being applied for purposes other than canal propulsion, do not particularly concern this narrative; for although, in 1796, Fulton published in London a treatise on canal navigation, wherein he advocates raising and lowering boats by steam inclined planes, yet he makes no mention of steam boats therein; though in January, 1803, he described some experiments with paddle wheels, as more advantageous than the system of chaplets, or endless bands of floats for propeling a system of boats, which were designed to be formed with bows and sterns convex and concave, so that several would form a line with almost continuous sides. Yet he does not seem, even after his practical success on the North river, in 1807, to have again advocated steam for canal uses. In later years, this arrangement of boats has been revived again and again.

Richard Trevethick and Robert Dickinson took out a patent in 1809 for moving an oar, provided with valves, forward and backward in a channel under a boat; and two years later, one Rose received a patent for constructing a canal boat, with water courses open to the water below and at each end, with two or more paddle wheels and cranks acting on the water. No drawings of these plans are known to be in existence. In the same year were also granted two patents for propeling boats by discharging water at the stern by means of a steam pump, similar to Rumsey's principle, but no experiments are noted.

In 1812, but one patent was issued for improvements in canal navigation, where endless bands traverse over wheels at the end or sides of a vessel, and carrying hinged floats to act on the water when propeling the boat, but caused to lie flat on the reverse stroke, in a manner not plainly described.

In the following year, we find an invention by Thomas Mead, who proposes a double endless chain, moving around two wheels, above and below two parallel tubes; on the chain belt are series of pistons, packed so as to pass steam tight through the tubes. Steam from the boiler forces the pistons continuously along one tube, at the end of which they are successively detained and released by catches, and pushed forward a small distance by eccentrics. The steam escapes by a hole in one of the tubes, which is uncovered at proper times, as the pistons require.

In 1815, Richard Trevethick patented a screw propeller, consisting of a worm or screw, or a number of leaves placed obliquely round an axis, which revolves, preferably within a cylinder, at the head, sides, or stern of a vessel. In some cases the screw is to be made buoyant, and works in a universal joint, the advantage of which construction is hard to perceive.

John Millington, during February of the year 1816, lays claim to a propeller more modern in its features than any preceding. He also claims forcing air into tubes, which operated against the water at the stern to propel the boat. In the same year, we have an arrangement with several cranks on the side of a vessel, connected with each other by horizontal connecting rods, upon which are placed vertical vanes of a curved shape, so as to act upon the water by the revolution of the cranks one way (but carried forward above the surface); and in the next, a method of propulsion by operating oars, held vertically at each side of the boat, in a similar manner to Fitch's earlier experiments, except that, by means of cog wheels, the oar blades were feathered, to pass edgeways through the water during the return stroke.

About the same date, Niece proposes propeling a boat by the pressure, on the water, of the gas and rarefied air produced by the inflammation of the essential oil of resin, injected at intervals into an air reservoir and then ignited. The gases pass through tubes, provided with valves, into a well, from which they expel the water with force along a tube opening below water mark at the stern of the boat. By the use of two receivers, and by spiral blowers, refilling the air reservoirs, the propulsion is effected more evenly.

MANUFACTURE OF VARNISH IN ENGLAND.

[Condensed from the English Mechanic.]

The varnish we shall more particularly describe is that made by intimately mixing gum copal with linseed oil and diluting the mixture with turpentine—the preparation of which requires no small amount of care and attention, and attention, and was formerly attended with no little danger from fire. Copal is a resin found exuding from the *Rhus copallinum*, a tree growing in several parts of America, and from the *Elæocarpus copallifer*, a tree found in the East Indies; it is also imported from the coasts of Guinea. The two latter kinds are generally allowed to be the best, and are commonly known as African.

The object to be obtained in the preparation of varnish is to impart to it a quick-drying property, retaining at the same time transparency and elasticity. To secure these characteristics great care is necessary, in melting the gum, in boiling that and the oil together for the requisite time and at the proper degree of heat, and in the complete solution of the resinous matter employed. To achieve these results a pure and limpid sample of oil is generally chosen, which is placed in a copper pan holding from 80 to 100 gallons, and heat gradually applied till the scum rises, after removing which the oil is allowed to boil for about two hours, when it is dosed with calcined magnesia in the proportion of an ounce to every four gallons of oil, but added by degrees and with occasional stirrings. This being completed, the oil is again boiled briskly for about an hour, and then, the furnace being drawn allowed to cool. When the temperature is sufficiently reduced, it is removed to leaden cisterns, where it is stored till fit for use.

Under the old system of making varnish, the gum pot and oil pot were open to the atmosphere of the shop in which the operation is performed; but the vapors arising during the process are now either taken into the furnace shaft, or condensed into liquid by suitable refrigerators. The *modus operandi* is somewhat as follows. The oil being placed in its boiler and approaching the requisite degree of temperature —namely, that at which the gum melts, the copal is placed in its copper, about 10lb. being the usual quantity fused at a time. In a few minutes it begins to melt, and gives off unpleasant vapors. When thoroughly melted and clear, a portion of the oil is added, and the mixture boiled and stirred till of the proper consistency; it is then taken and emptied into the boiling pot, from which the requisite quantity of oil for the following charges of gum has been previously withdrawn. The gum pot being thoroughly cleansed, another portion of the gum is placed in it and melted in a similar manner to the first, and so on, till sufficient gum has been fused for the quantity of oil prepared. The whole is then placed on the furnace and boiled till a scum rises and spreads gradually over the whole surface, which then froths up rapidly in the same way as boiling milk, and must be instantly removed, when the scum being stirred down, the dryers are added, a little at a time, and the boiling continued till the mixture feels stringy to the fingers. The boiling pot is then removed from the fire, and when sufficiently cool, turpentine is added till the desired consistency is attained, when the varnish may be placed in the storing tanks. Formerly a great waste of turpentine took place by evaporation through mixing it while the varnish was still too hot; but of late years a vast improvement has been adopted in this respect, and it has been practically demonstrated that not only is there no necessity for "boiling" the oil and gum after incorporation but that the produce is equally good if the turpentine be added just before the mixture becomes too cold to permit of a perfect amalgamation. In fact, it is now acknowledged that the oil need not be raised to a higher temperature than that at which the gum employed fuses, and that when the two are mixed the lowest possible degree of heat which will insure their incorporation, is sufficient to secure all the results desired. By this method a large quantity of the turpentine formerly lost in evaporation, is saved and there is, moreover, less risk of fire. It is indeed a moot point whether it is absolutely necessary to add turpentine in quantity at all, as even when the loss during the preparation of the varnish is reduced to a minimum, a still further reduction occurs whilst the varnish is ageing and clearing in the storing tanks, and it is sometimes found necessary to thin it before it can be used.

To prevent the workmen being distressed by the pungent odors of the melting gum, in modern varnish factories the boiling and gum pots are placed close together, and by means of caps and heads (provided with openings to facilitate stirring,) the pots are connected with chimneys which carry off all vapors into the smoke shaft, or to the condensing tanks. A close fitting cover is also provided for the boiling pot to extinguish the flames in case the oil should take fire—a great improvement on the old fashioned carpet, which an assistant stood ready to throw over in case of accident; while tramways are laid down so that the boiling mixtures can be rapidly conveyed into the open air in the event of firing, and for the purpose of cooling before the addition of the turpentine.